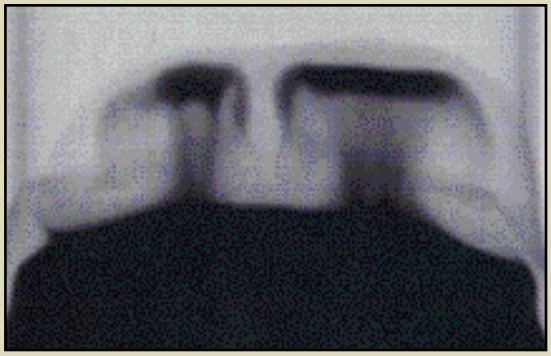
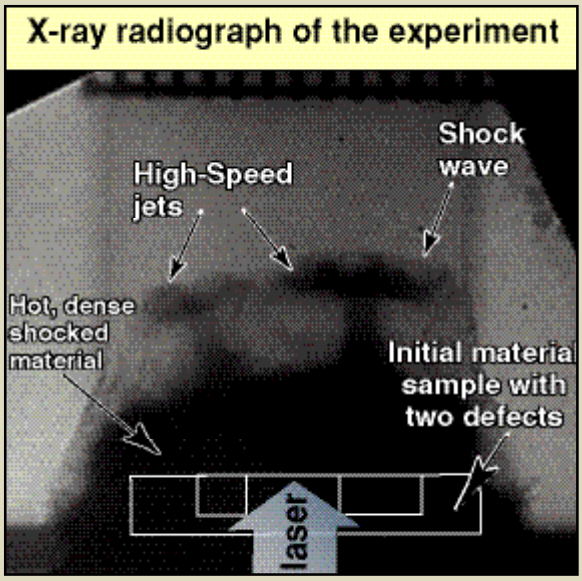
Collaborative NIF Experiments – May 2004

A series of hydrodynamic experiments on NIF culminated with the first multilaboratory collaboration between Lawrence Livermore and Los Alamos National Laboratories toward a detailed scientific understanding of the physics of hydrodynamic jets.

During the campaign, two experiments were undertaken. New continuous phase plate technology was used to smooth the laser beam profiles, allowing the quantitative measurement of the hydrodynamic evolution of the jets. Livermore-designed experiments studied the temporal evolution of two-dimensional and three-dimensional jets. These data provide high-quality experimental data to validate legacy and modern predictive codes. The Los Alamos experiments also studied the temporal evolution of three-dimensional jets using, for the first time on NIF, targets with multiple defects. The targets allowed access to the most complex physical processes demonstrated on NIF, including interaction zones between evolving adjacent shocks.



This simulation predicts the behavior of high-speed jets from a multidefect target. NIF experiments produced data that benchmark these simulations.



Data from Los Alamos National Laboratory experiments on NIF

High-energy NIF beams struck the target, launching a strong shock wave. The interaction of this shock with the defects in the target generated dual high-speed jets of aluminum, which mixed with low-density foam within a shock tube. Nanoseconds later, another NIF beam struck a point-projection backlighter target behind the aluminum target. The backlighter target generated x-rays that illuminated and recorded images of the evolving hydrodynamic jets.

These latest experiments generated data that further benchmark two- and three-dimensional code capabilities and demonstrate the ability to perform complex hydrodynamic experiments on NIF.

Article from FON UCRL-MI-143123-04--5-05/06